AIR CLEANING PROGRAM AT THE LIVERMORE RESEARCH LABORATORY

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To appreciate the air cleaning program at the Livermore Research Laboratory operated by the California Research & Development Company, it is necessary to place ourselves geographically, meteorologically and problem wise.

Livermore, California is located approximately 45 miles east and south of San Francisco, at the eastern end of the Livermore Valley. The outline of the valley itself is roughly an enlongated oval - or football shape - with the long axis on the east west line, and it is relatively small being some 13 miles long and six miles wide. The surrounding hill structure averages some 1700 feet with a small opening in the southwest corner. So that the valley, when viewed from above, resembles a large bowl with a flat bottom. Figure I.

The region is wholly an agricultural area: the largest crop being wine grapes, and secondly cattle raising.

The meterological conditions can best be stated, as extracted from a United States Weather Bureau report on this area as prepared by Paul Humphrey of the Arco Idaho Office.

"The expected meteorological conditions at the Livermore, California Site are, from a practical viewpoint, entirely favorable as far as the more familiar climatic elements are concerned. Surface temperatures, winds, and rainfall are of comparatively little concern when considering construction problems or the comfort of personnel. Primarily, meteorology must be considered because of the effects of atmospheric conditions upon harmful effluent which might be released from stacks during various operations. In that respect, considering the fact that the Livermore Site is in a bowl-shaped valley surrounded by an important agricultural area and a significant population, the meteorological conditions are less favorable. High stacks alone, such as are used at some other sites, would not be practical as a method for the elimination of harmful concentrations of effluents. Such stacks would lessen ground contamination on the site itself, but would not significantly reduce average ground concentrations within the Livermore Valley. It appears that safe routine operations as far as stack effluents are concerned should be brought about by properly engineered devices for cleaning off-gases rather than by consideration of meteorological conditions."

The atmospheric conditions present three basic points: (1) Prevailing SW wind during summer days. (2) Prevailing NE wind during winter days. (3) Stable (calm) conditions at least ten percent of the nights, and some four percent of the days during the winter months.

Problem-wise: At the request of the Atomic Energy Commission, the Standard Oil Company of California formed the California Research & Development Company, some three years ago, to work on the MTA program. This new company presented a very fine situation from the health physics standpoint, as the engineers were very receptive to suggestions and ideas. Few, if any, were bound by any predetermined concepts of radiation control, etc. As a practical result, the health physics staff was able to institute its own predetermined concepts of radiation control.

The assigned problems to the company were principally basic research, and as such necessitated chemistry and physics laboratory space: metallurgical test cells, process cells, etc.

Thus, to the engineers we gave the following base-lines we wanted to follow:

1. All potentially contaminated air will be:
   a) Cleaned
   b) Sampled
2. All duct work will be:
   a) Readily accessable
   b) Easily replaceable
3. All filters-assemblies will
   a) Have pre-filters
   b) Be accessible for ease of change
   c) Have a simple indicating device for loading effect.

To a great extent we succeeded and our active air cleaning program is essentially this:

"All potentially contaminated air is filtered as close to its source as is practicable: this air is then sampled as it is discharged to atmosphere."

"The general atmospheric contamination is checked by constant air sampling in and around the entire Livermore Valley."

To accomplish this, we have standardized, in general, our units to certain filtering equipment and procedures. The fume hoods, for example, are all equipped with 2' x 2' x 2" fiberglass prefilters and 2' x 2' x 5-7/8" CWS #6 equiv. back-up filters. Gloved-boxes have "thaxter" PF105 prefilters and 8' x 8" x 5-7/8" CWS #6 equiv. final filters. Figure III. The glove box manifolds (each having a capacity for 12 boxes) are equipped with an additional back-up, or insurance filter (CWS #6 equiv.). The filters are either incorporated into plywood throwaways or are top loading for ease of change. The only filter units not at shoulder level (or lower) are the gloved box insurance filters; however, the anticipated rate of change for these units is once every four years.

The effluent air is sampled in each duct run, the samples being so arranged that any detectable activity can be in turn traced to its source. For this purpose, we use a sampler that is injected into the duct stream and operated in the Isokinetic Region of flow. Figure IV.

The laboratory room air is sampled by use of "Filter Queen" type vacuum cleaners and we extract the air through a 3-1/2" diameter disc of HV-70 paper. The 3-1/2" diameter was chosen to meet the maximum sized scintillation counter that was constructed at the time our program was initiated. Figure V.

The valley air is sampled at various points throughout the countryside and for this purpose, we have used a "moto-air" unit and again, we have used the 3-1/2" diameter discs. Figure VI. These units operate continuously and the papers are changed once each week. In addition to a radio-count of the papers, for both alpha and beta-gamma, we run a radioautograph of the papers. We actually find that the particle count is a much more sensitive device than the counting procedures.

To summarize our program for air cleaning which is really a four point plan, we can keep with the modern trend and call it operation "test".

1. Test new equipment
2. Educate engineers
3. Sample effluent laboratory air
4. Take continuous environs backgrounds

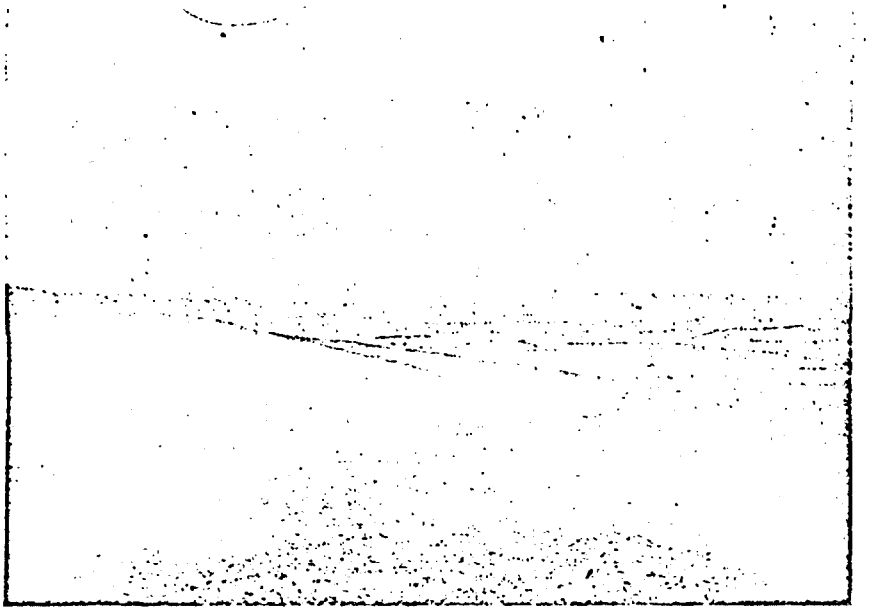


FIGURE I

PICTURE OF THE LIVERMORE VALLEY

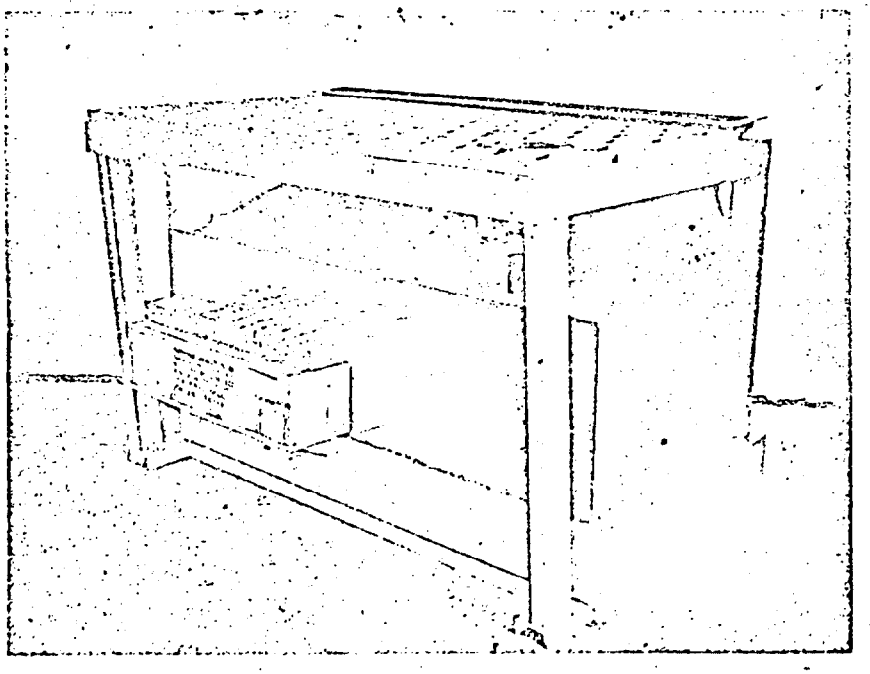
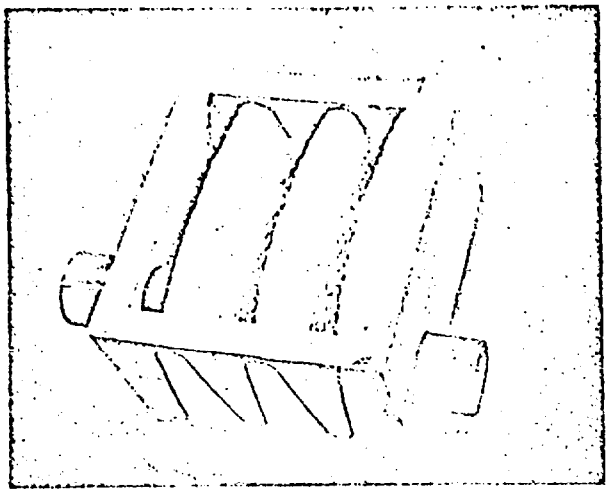
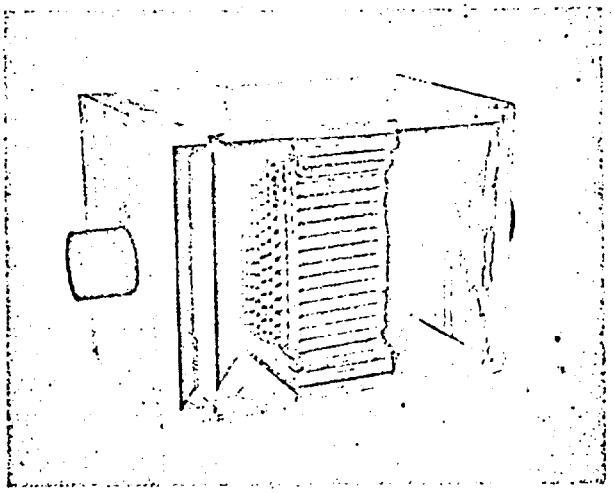


FIGURE II

FILTER BED IN FUME HOODS



A. "THAXTER PREFILTERS"



B. CWS 6 (EQUIV.) FILTERS

FIGURE III

GLOVED BOX FILTERS

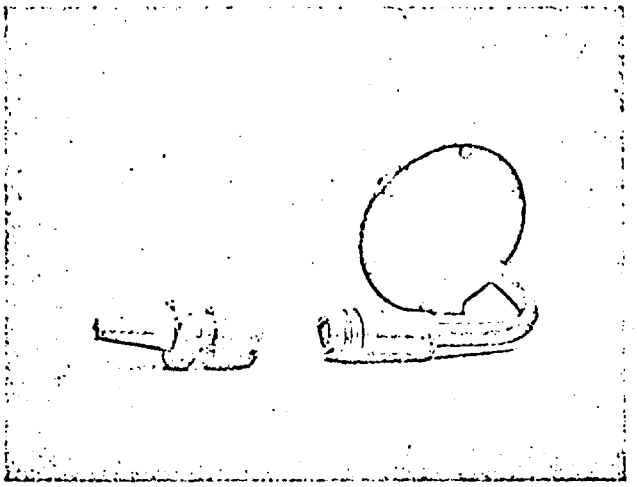


FIGURE IV

ISOKINETIC SAMPLER

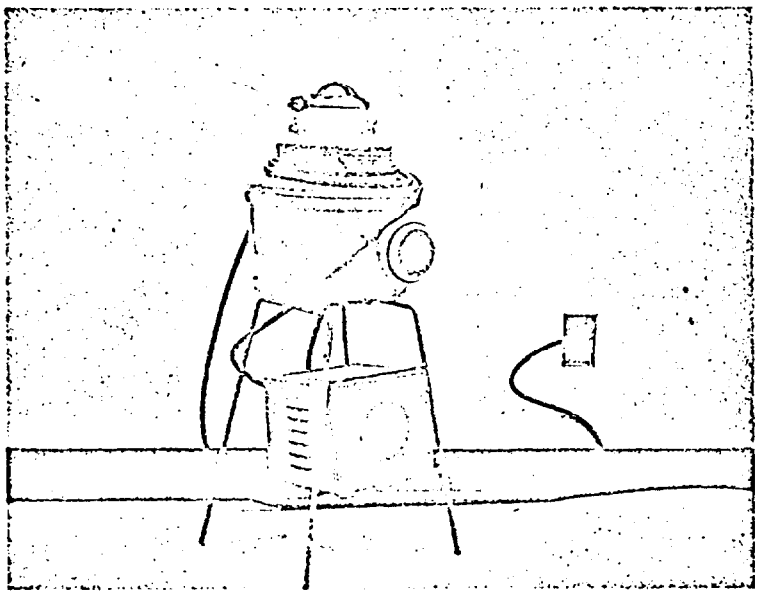


FIGURE V

"FILTER QUEEN" SAMPLER

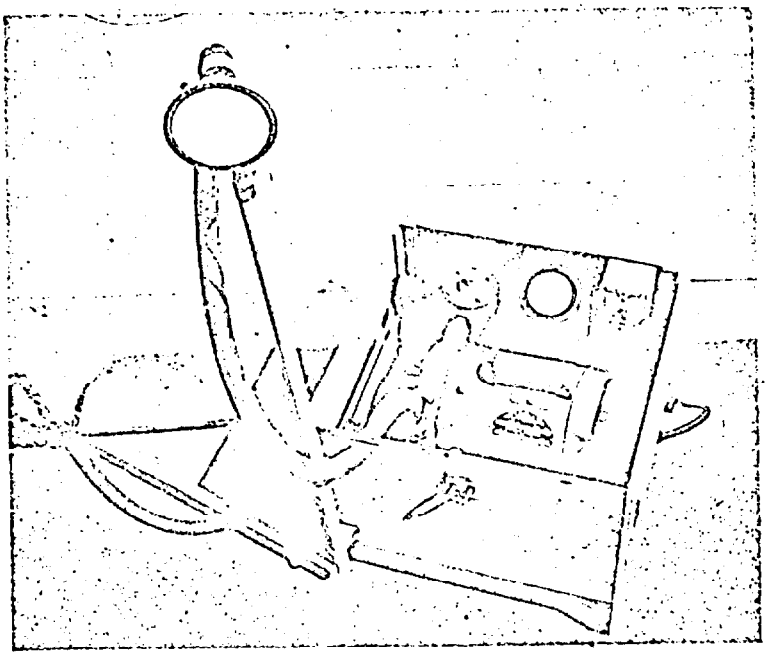


FIGURE VI

"MOTO-AIR" SAMPLER